

WHAT IS CLAIMED:

1. Apparatus for producing silver nano-particle material, comprising:

5 a furnace, said furnace defining an interior region therein;

10 a crucible positioned within said furnace, said crucible containing a quantity of precursor material, said furnace heating the quantity of precursor material contained in said crucible to vaporize the precursor material;

 a process gas supply operatively associated with said furnace, said process gas supply providing a process gas to the interior region of said furnace;

15 a conduit having an inlet end and an outlet end, the inlet end of said conduit being open to the interior region of said furnace;

20 a particle separator system comprising an inlet end and an outlet end, the inlet end of said particle separator system being connected to the outlet end of said conduit; and

25 a pump operatively associated with the outlet end of said separator, said pump causing a mixture of process gas and vaporized precursor material contained in the interior region of said furnace to be drawn into the inlet end of said conduit, the process gas cooling the vaporized precursor material to precipitate said silver nano-particle material in a carrier stream, said particle

separator system separating said silver nano-particle material from the carrier stream.

2. The apparatus of claim 1, wherein the inlet end of said conduit further comprises a hood-like section.

5 3. The apparatus of claim 2, wherein the hood-like section of the inlet end of said conduit is positioned in substantially vertical alignment over said crucible, the hood-like section and the crucible defining a mixing region substantially therebetween.

10 4. The apparatus of claim 1, wherein said particle separator system further comprises a material discharge port, said silver nano-particle material being discharged to said material discharge port.

15 5. The apparatus of claim 4, further comprising a product collection apparatus operatively associated with the material discharge port of said particle separator system, said product collection apparatus collecting said silver nano-particle material.

20 6. The apparatus of claim 4, wherein said particle separator system further comprises a filter positioned between the inlet end and the outlet end, said filter separating additional amounts of said silver nano-particle

material from the carrier stream.

7. The apparatus of claim 1, further comprising:
 - an induction coil positioned within said furnace, said induction coil being magnetically coupled to said crucible; and
 - a power supply operatively connected to said induction coil, said power supply causing an alternating electrical current to flow in said induction coil.
- 10 8. The apparatus of claim 7, wherein said induction coil substantially surrounds said crucible.
9. The apparatus of claim 8, further comprising an insulator positioned between said induction coil and said crucible.
- 15 10. The apparatus of claim 1, wherein said crucible comprises carbon graphite.
11. The apparatus of claim 10, further comprising a non-reactive liner provided on an interior surface of said crucible.
- 20 12. The apparatus of claim 11, wherein said non-reactive liner comprises ceramic.

13. The apparatus of claim 1, further comprising a precursor material feed system, said precursor material feed system continuously providing the precursor material to said crucible.

5 14. The apparatus of claim 13, wherein said precursor material feed system further comprises:

 a supply of precursor material in metallic wire form; and

10 wire feed apparatus, said wire feed apparatus feeding the metallic wire form precursor material to said crucible.

15. The apparatus of claim 1, wherein said process gas supply comprises a supply of nitrogen.

16. The apparatus of claim 1, wherein said conduit
15 comprises quartz.

17. The apparatus of claim 1, wherein said process gas supply comprises a supply of argon.

18. A method for producing silver nano-particle material, comprising:

20 providing a precursor material in a crucible,
 the crucible being housed in a furnace;
 heating the precursor material in the crucible

to produce a vaporized precursor material;

contacting the vaporized precursor material with
a process gas in a mixing region;

5 drawing a mixture of vaporized precursor
material and process gas into an inlet end of a
conduit, the process gas cooling the vaporized
precursor material to precipitate said silver nano-
particle material in a carrier stream; and

10 separating said silver nano-particle material
from the carrier stream.

19. The method of claim 18, wherein said heating the
precursor material in the crucible comprises inductively
heating the crucible, heat from the crucible being
conducted to the precursor material.

15 20. The method of claim 18, wherein said heating the
precursor material in the crucible comprises heating the
precursor material to a temperature in the range of about
1600 to about 2000°C.

20 21. The method of claim 18, wherein said method is
conducted at a pressure in the range of about 0.1 to about
6 torr.

22. The method of claim 18, wherein said contacting
the vaporized precursor material comprises contacting the

vaporized precursor material with nitrogen.

23. The method of claim 18, wherein providing the precursor material to the crucible comprises providing the precursor material to the crucible on a continuous basis.

5 24. The method of claim 18, wherein said providing the precursor material to the crucible comprises providing metallic silver to the crucible.